

Hydrogen Effects on GaAs, Status and Progress

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Abstract

It has been observed that GaAs devices in hermetically sealed packages when exposed to temperatures as low as 125 °C can exhibit unacceptable degradation in both RF and DC characteristics. The source of the problem was found to be hydrogen that has been absorbed in the package's metals (**Kovar**, plating, etc.) and converted into atomic hydrogen within the Pt **metallization** of the gate structure. Subsequently, atomic hydrogen **diffuses** into the channel region of the FET structure and neutralizes the Si donors, resulting in a degradation of the device characteristics. Most of the data indicates the onslaught of the problem to occur **after** 500 hours at 125 °C. This onslaught has been observed to be dependent on the thickness and processing conditions of the **passivation layer**, the sealing environment, and the amount of Pt or Pd in the gate structure of the device.

This paper will provide a description of the problem and a summary of the general understanding of the failure mechanism(s). A discussion of the observed or suspected reactions, the effects on device parameters, and the current industry efforts to find a solution to this problem will also be presented.